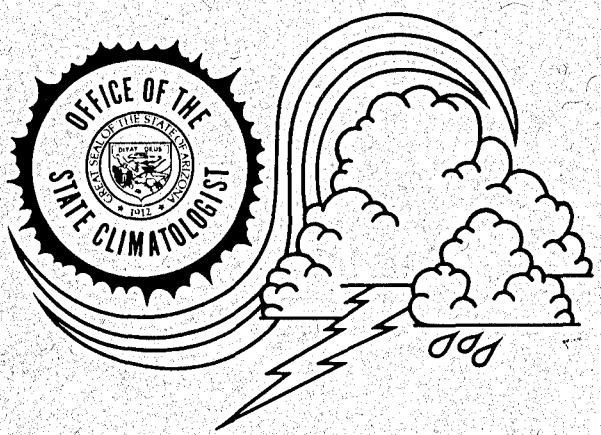
MAJOR STORMS AND FLOODS IN ARIZONA 1862-1977

Compiled from the records of the National Weather Service



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Robert S. Ingram

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THE STATE OF ARIZONA

OFFICE OF THE STATE CLIMATOLOGIST

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PREFACE

The first recorded observations of weather in Arizona were kept in the diaries and logs of the first explorers of the desert region of North America. Most of these have been lost, and the first records that we have in the files at The Office of the State Climatologist are those from the army post at Fort Yuma and the other forts established to protect the settlers of this state from the Indian tribes that threatened them. Until the time of the establishment of the weather service in the Signal Corps of the United States Army in 1870, these records were kept by the Medical Department of the army. Many of these old records contained notes on interesting or disastrous weather events that the observers thought to be important.

The practice of noting unusual weather events was continued when responsibility for the federal weather service was transferred to the Department of Agriculture in 1891. With the transfer of the weather service to the Department of Commerce in 1940, the principal responsibility of the Weather Bureau became to provide forecasts for the general public and for the aviation industry. With a change in the system of taking observations brought on by these new responsibilities, interest in notations about unusual weather events declined. However, since 1959, these events have been reconstructed from newspaper and telephonic reports and published in Storm Data, a monthly publication that summarizes these events over all of the United States.

This publication presents some of the information from the "Weather Notes" that has been recorded by weather observers over the years. These notes have been documented further by research done by the former State Climatologist for Arizona, P. C. Kangieser, and by employees of the State Climatology Office. The painstaking day-by-day extraction of the "Notes" was accomplished by the staffs of National Weather Service's offices in Flagstaff, Phoenix, Tucson, Winslow, and Yuma. Additional material was obtained from newspaper files and books. The collected material was edited by Mr. Kenneth F. Arline, staff writer for the Phoenix Gazette, and by Borgny Johnson of the Office of the State Climatologist for Arizona.

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MAJOR STORMS AND FLOODS IN ARIZONA 1862-1977

January 1862

On January 2, floods on the Colorado and Gila rivers washed away Yuma (Colorado City) located between Fort Yuma and Pilot Knob. The flood also swept through Gila City (population 1200) destroying most of the town.

January 1874

The San Diego stage arrived at Yuma on the 21st minus most of the mails, which the driver lost at the crossing of the Tia Juana River near San Diego. The weather at Yuma was clear but cold. The Colorado rose about fourteen inches on the 21st. The rise in the Gila River was attributed to the rains, which were so heavy that stagecoach passengers travelling from Maricopa Wells to Gila Bend reported that the stage was constantly in a foot of water. Citizens turned out in force to build embankments around their buildings.

The Gila River rose twelve feet at Yuma on the night of the 21st and the morning of the 22nd. On the 22nd, the people were still actively engaged in fortifying against the anticipated overflow and hoped that the town would not be flooded.

By 9:30 p.m., the Gila and Colorado rivers at last came together. An observer reported: "Water is pouring through the town. The greatest excitement prevails. The people in the central portion of town are still moving out to higher lands. The rush of waters is fearful to behold."

Three fourths of the town of Yuma was submerged in water from two to six feet in depth by the morning of the 23rd. The houses were deserted and rowboats plied the streets. The San Diego Union reported: "The damage . . . in the vicinity of Phoenix was considerable. Nothing but the most strenuous efforts saved the fine flour mill of Hellings & Co. east of Phoenix from being washed away . . . . An assessment of $100 per share will be required to repair the damage to Swilling's irrigation ditch . . . . The flood came within two hundred yards of Goldwater's store and was nearly three miles wide at that point carrying everything before it."

Between 3:00 and 4:00 p.m., however, the Gila River arrived at its greatest height and shortly afterward began to fall. The damage was very slight, contrary to the views of all. By the evening of the 23rd, the stage was able to leave for San Diego.

February 1874

Observers from the mountains back of Prescott reported from four to six feet of snow on the 19th.

Shortly after dark on the 23rd, snow began falling again at Prescott, and for several hours that section of the state was subject to a violent, blinding snowstorm.

July 1876

A terrible storm on the night of July 30 left destruction and death in its wake. The storm lasted several hours and was the most severe storm ever known to this part of the Territory. A heavy blast of wind from the southwest destroyed the gable end of Messrs. Smith and Stern's store. It was constructed of adobe, and the mass fell upon a young man who was sleeping in the store, bruising him so badly that he died during the night.

July 1878

On Wednesday, July 31, Phoenix was visited by very severe rain preceded by one of Arizona's peculiar sandstorms. The rain began falling about 5:00 p.m. and continued almost the entire night. According to the gauge at the military telegraph office, 2.5 inches of water fell.

December 1879

On the 29th at Phoenix, an unusually heavy rainstorm caused the river to rise ten feet in two days.

August 1881

A cloudburst occurred in the Hassayampa Canyon near Wickenburg on the 6th. The Hassayampa River was perfectly dry at sunset on the 6th, but by 11:00 p.m. it was a mile wide and from two to fifteen feet deep. Thirteen hours later the river was again dry. Ten tons of freight being hauled to Phoenix were destroyed in the cloudburst. On the 17th, a flood interrupted communications and did much damage in the Salt River Valley near Phoenix.

August 1882

Serious washouts occurred between Casa Grande and Yuma on the 24th.

December 1883

The Hassayampa River at Wickenburg, which had been dry for several months, suddenly rose on the 22nd beyond the fording stage, remained high over the 23rd, and then fell rapidly. Phoenix reported a fourteen-foot rise on the Salt River, and the dam and canal headgates were ripped out by the water.

March 1884

A cloudburst on the 7th at Florence flooded the streets four feet deep.

On the 10th, several miles of track were washed away east of Yuma. The Gila River rose two feet, five inches overnight so that the gauge read twenty-three feet, five inches on March 10. Reports were circulated that the river was rising east of town, but no immediate action was taken by the residents to evacuate their goods until water began rushing into the village during the night of the 10th. On the 11th, the Gila continued its rampage, broke through its levees at Yuma, and flooded that city. All of the buildings in the flooded area were constructed of adobe and most washed away. No lives were lost.

June 1884

The Colorado River at Yuma was at flood stage on the 9th. The railway west of town was seriously damaged, but the town itself was not damaged because levees had been reconstructed since the March flood of the Gila.

July 1884

The flooded Colorado washed away parts of the railway bridge at Yuma on the 1st and the 3rd.

September 1885

A freshet occurred on the 9th at Pantano. The railroad track was damaged and covered with water to a depth of several feet.

August 1886

This was a month of floods at Yuma. Light rain fell most of the day of the 1st. The rainfall was heavy seventy-five miles west of Yuma. The railroad was washed out and trains were delayed.

On the 15th, there was a thunderstorm with rainfall measuring 1.57 inches of which 0.80 of an inch fell in twenty minutes. This rainfall

washed out the railway both east and west of Yuma and caused complete suspension of traffic for several days. Heavy rains in the mountains on the 27th washed out track east of Yuma and trains were again delayed.

July 1887

On the 7th, Nogales experienced an unusually heavy rain which flooded streets, destroyed bridges, and washed away railroad tracks.

A cloudburst occurred during the afternoon of the 8th on the east fork of the White River in the mountains east of Fort Apache. A volume of water three feet deep came down the canyon and subsided in two hours.

Heavy rain occurred again at Nogales on the afternoon of the 13th. A cloudburst was also reported in the mountains southeast of Sonora. Railway traffic was stopped for nearly a month.

August 1887

Numerous freshets were reported on the Santa Cruz and Rillito rivers during the month.

September 1887

On the 9th, the Santa Cruz and Rillito rivers experienced heavy freshets which destroyed several miles of track and some bridges near Pantano. Five miles of track and three bridges were washed away on the Sonora railroad on the 12th. A fifty-foot-high railway embankment near Dragoon was washed out for eight miles.

October 1888

On the 18th, a violent downpour of rain caused extensive washouts along the railway between Yuma and Texas Hill.

December 1889

The Verde and Salt rivers rose rapidly on the 5th, and the Verde overflowed its banks at Fort McDowell.

The Verde overflowed at Fort Verde on the 6th.

February 1890

Rain covered the Territory on the 19th and continued for three days or more with little let-up. The rains melted snow in the higher elevations so that runoff amounts rose rapidly. The newly completed $600,000 Walnut Grove Dam in Yavapai county burst on the 22nd, drowning about fifty people. The Salt, Gila, Colorado, and Santa Cruz rivers all overflowed their banks. The Salt River rose seventeen feet, washing out the Tempe bridge and miles of track between Tempe, Maricopa, and Yuma. Adobe houses in Yuma and Phoenix were washed away. Farmland was washed away. Livestock was swept away and people were stranded all over the Territory.

At Fort Verde, the river reached its highest flood mark on the 21st when it washed out irrigation ditches. A large area of the Gila Valley was flooded, and irrigation ditches were severely damaged.

August 1890

At Eagle Pass, the Gila was impassable for ten days and ditches were destroyed.

October 1890

Heavy thunderstorms at Yuma on the 4th destroyed bridges and washed out the railroad.

February 1891

Two Pacific storms dumped rain over the Arizona Territory during the period of February 15 to February 23. Melting snow and heavy rainfall yielded the greatest floods on record for the Salt and Gila rivers. Heavy rainfall began in the Phoenix area on the 16th. After three days it tapered off but started again and continued to the 23rd. The Salt River rose one foot higher than the 1890 flood, being eighteen feet above normal at one point during the flooding. The Tempe railroad bridge was washed out on the 18th along with telephone and telegraph wires. At some places below the junction of the Salt and Verde rivers, the Salt was eight miles wide. Below Phoenix, it was two to three miles wide. Ditch heads were torn out, and livestock and crops were washed away. People climbed up onto roofs and into trees to escape the rushing waters. The canal gates and dams were washed out on the 19th. Adobe buildings melted away in the waters. The flood reached its height on the 20th.

Almost every town in the Territory suffered some damage. By the 23rd, the rain had been falling for six days at Cottonwood. Farley's Camp reported on the 23rd that there had been four inches of rain in nine hours. Granite Creek in Prescott ran wild, washing out homes and cutting new channels. The Agua Fria was swollen by melting snow. Pinal Creek washed away the blacksmith and his shop in Globe. Many roads and bridges were

washed out including the newly completed road between Tip Top and Gillette. Most of the stagecoaches and all of the trains were brought to a standstill.

The Gila River at Fort Thomas was very high on the 19th. The flowing waters prevented travel west of Fort Thomas to Black Rock. Clifton also suffered severe flooding. South of the Gila River the rains were lighter. The town of Yuma suffered the most damage for two reasons: the Gila and Colorado rivers were at the highest levels ever recorded and they were high at the same time. Both rivers began rising on the 19th. A small levee protected the town which sat on a low flat. The levee broke on the 22nd, and by 9:00 p.m. half of the town was in ruins. Everything east of Main Street was washed away except for three frame houses. Many miles of railroad track were under water or washed away. Above Yuma, the river was seven miles wide. Below Yuma, there was a lake reaching fifty miles across in some places. Many people were homeless, and food supplies were low. Several deaths by drowning were reported among ranches and the local Indians living along the Gila.

Holbrook and Fort Thomas reported the highest water levels ever known on the 24th. The Gila River at Eagle Pass was seven feet above high water mark. Much destruction occurred and many lives were lost. Waters continued to rise.

The hastily repaired embankment protecting Yuma's Main Street again gave way on the 27th, and the town was flooded once more. The water reached a height of 33.2 feet at 1:00 a.m. at the railroad bridge but may have been four inches higher during the night. The river began falling rapidly after this. By the end of the month the trains still had not resumed operation.

May 1891

The Phoenix Daily Herald of May 12, 1891, states, "The residents of the Salt River Valley were treated to a genuine thunderstorm yesterday with considerable rain, a thing that has not happened here in May since 1878 when considerable rain fell for two or three days. The present rain will damage the wheat crop greatly by inducing rust; otherwise, the damage will be very light."

Autumn 1891

The Santa Cruz River was flowing due to a large cloudburst in the mountains. The river cut through agricultural land and washed away crops, animals, and buildings. The water levels went down to a calm state, and people enjoyed the water because it normally was so scarce. Later in the month, the river went completely dry.

October 1895

A railroad bridge near Maricopa was ripped out by floods on the Gila.

October 1896

On October 1, two cloudburst in the Whetstone Mountains sent flash floods through Benson. Two mothers and four children drowned.

September 1897

On the 11th and 12th, nearly all crop correspondents reported water plentiful, the ground moist on the ranges, water holes full, and the streams supplying the canals and ditches with water needed for irrigating purposes. The rainfall at a few places was excessive, and downpours caused short-lived floods that damaged the aggregate canal and other property to a considerable extent. An excessive fall (1.89 inches in fifty-five minutes) occurred at Phoenix on the 11th. The shower also covered the valley below Phoenix. From previous recent lighter rains in the valley above Phoenix and in the mountainous part of the Salt River watershed, the river was well up and the canals full when the storm occurred. The river was not able to hold the additional supply. The banks gave way in many places, and the country was flooded for a few hours.

Severe wind and rain hit Tempe also. The Salt River was nowhere fordable and people were obliged to cross the river on foot by way of the railroad bridge.

July 1898

The Florence stage due at Mesa on the night of the 15th did not reach there until noon on the 16th. The delay was caused by the rise of the Gila at Riverside where the stage from Globe had overturned in the river, throwing all the mail and two passengers into the raging current.

Reports from the Phoenix Daily Enterprise of July 19 stated: "Even the most incredulous now believe that there has been rain in the mountains. The town ditch is brim full and running over with muddy water. For several blocks through the city the overflow has been so great that one could have floated over the vacant lots in a skiff."

The Holbrook Argus reported on July 30 that two Indian girls were killed when they rode onto a bridge on the flooded Puerco. Bystanders shouted warnings, but the bridge gave way and the girls were carried downstream. Efforts to save them were of no avail.

December 1898

The month was remarkable for the general severity of the weather, and this severity was evidenced not only by reports received from voluntary observers in all sections of the Territory reciting personal experiences, but also by a comparison of the mean temperature of stations, which showed a deficiency of nearly five degrees.

With the exception of the southwestern part, a snowstorm pervaded the whole Territory, the snowfall recorded varying from a trace to thirty inches. In the vicinity of Phoenix, the snow melted almost as fast as it fell; but it was estimated that the measurement would have exceeded six inches had the snow lain upon the ground. Since the meteorological records of this station extend over a period of only three years and during that time there is no record of snow, we depend upon tradition when we state that it was the heaviest snowfall within the recollection of the oldest inhabitant. The snowfall apparently occurred on the 10th. As the weather observer at Peoria stated: "On the 10th it snowed about twelve hours commencing about 1:00 a.m. and continuing until 12:00 midnight, making about three inches on the level which remained on the ground forty-eight hours before melting. This was the greatest snowfall ever recorded at this station."

January 1905 ✓

The rainfall was decidedly in excess of the normal amount over the greater portion of the Territory during January. That which fell occurred principally between the 8th and 18th. In Yavapai, Mohave, Coconino, Navajo, Apache, Graham, and Gila counties, the depth of snowfall was greater than for several winters past. In consequence, the runoff produced by the melting snow and large rainfall flooded many streams beyond their banks. In the Salt and Gila River watersheds, some damage was wrought by the floodwaters which washed away railway and turnpike bridges, embankments, dams, and telephone and telegraph poles and delayed traffic for about ten days. At the end of the month, there were from three to five inches of snow upon the ground in the northern tier of counties and a much greater amount upon the mountains. In the mountain ranges within Maricopa county, a thin covering of snow was visible until the 27th.

February 1905 ✓

Frequent and unusually heavy rainfall was measured throughout the Territory. In some localities, particularly Maricopa, Gila, Yavapai, Pinal, and Coconino counties, the monthly amounts ranged between 3.00 and 10.00 inches. At Phoenix, the total for February was 4.64 inches. The amount recorded this year to date is 7.95 inches--2.38 inches greater than that which occurred during the entire year of 1904. There was slightly less snowfall in the mountains than during January. That which fell in the northern sections of the Territory during the first two decades began to melt slowly on the 21st, and by the end of the month

the runoff, augmented by the rainfall, filled the river beds to overflowing and caused several washouts.

March 1905

There was frequent and heavy rainfall in the south and heavy snowfall in the north portion of the Territory from the 1st to the 18th. Farmwork was practically suspended during the second decade of the month. Rapidly melting snow produced flood stages in the Salt, Gila, and Little Colorado basins, which washed lands badly, injured crops, and caused much damage to railroad property, thereby delaying traffic for several days.

April 1905

Above normal precipitation continued over much of the Territory. In the northern counties farm work was greatly delayed by the moist condition of the soil and by the thick coverings of snow. There, grass grew very slowly. Lands were irrigated in the central and southern counties according to the small need of water for growing crops. The supply of water was adequate for all purposes.

November 1905

Precipitation was excessive over the entire Territory during November, the departures ranging from plus 1.25 inches to plus 5.00 inches. Twenty to 40.0 inches of snowfall was measured over the San Francisco range near Flagstaff and 11.0 to 20.0 inches over the Bradshaw range near Prescott. This is considered the greatest depth of snow on record for November. The heavy precipitation of the 26th swelled the streams to very large proportions, washed roadbeds, and damaged toll and railway bridges.

August 1906

The precipitation was greatly in excess of the normal with the exception of a few localities in the southern counties where the departures ranged from minus 0.75 of an inch to minus 1.60 inches. The departure over the northern counties was plus 1.29 inches; and, for the western section, the departure was plus 1.52 inches.

The runoff produced by the generous and heavy rains of the first two decades added large volumes of water to the bounteous supplies within the river beds. Many of the streams were unfordable from the 13th to the 21st. The depth of water within the river beds throughout the month was variously estimated at being between three and eight feet. The supply of water was so plentiful that the larger canals and cross-cut canals were running under full head and flow during the entire month without any intermissions. At the end of the month, the volume of summer irrigation water available was fully 30 percent greater than the supplies of any other summer during the past six years.

December 1906

During the month, there was excessive precipitation. The northern division received the largest amount of precipitation and the southwestern section the smallest. Under the influence of the warm rains of the 1st, 2nd, 3rd, and 4th over the watersheds, the accumulated snow of November melted rapidly. This runoff filled the river beds, causing freshets in many of the streams and severe floods in the San Francisco River, a tributary of the Gila, on the 3rd, 4th, and 5th, whereby many lives were lost from drowning, much property was destroyed, and railroad traffic was delayed for more than a week. Additional rain and snowfall on the 12th, 26th, and 27th kept the Colorado, Little Colorado, Gila, Salt, San Francisco, San Pedro, and Verde rivers at high and unfordable stages during the last half of the month.

October 1907

Exceptionally heavy rains occurred over the entire Territory and were general on the 4th, 5th, 15th through 18th, 23rd, and 31st.

At most of the stations in southern Maricopa, western Pima, and Yuma counties, the amounts that fell in October were in excess of the total amounts of precipitation recorded during the preceding six months. At Mohawk Summit, the heavy rains of the 23rd damaged county roads and railroad beds, delaying traffic for several days. The region of greatest precipitation embraced the San Francisco, the Black Mesa, the Mogollon, and the Mount Graham ranges and extended from northern Coconino County southeastward to northern Graham County. The amounts within this area ranged from 2.70 inches to 8.50 inches. As usual, the area of least precipitation included Pima, southern Pinal, southern Maricopa, and Yuma counties, the amounts varying from 0.86 of an inch at Vail to 1.32 inches at Yuma.

February 1908

The average precipitation was largely in excess of the normal, being exceeded only twice during the past twelve years, in 1901 and 1905. Precipitation was general over the Territory on the 3rd and 4th, the 10th through 12th, and the 22nd. The precipitation on the 3rd was exceptionally heavy, with amounts equalling or exceeding 2.00 inches reported at a number of stations (maximum 4.55 inches at Pinal Ranch).

On the 3rd and 4th and the 9th through 13th, the combined rain and snowfall produced a large runoff in the upper drainage areas of the Salt, the Gila, the San Pedro, the Hassayampa, the Auga Fria, and the Bill Williams Fork rivers, filling the river beds to moderate depths for their entire lengths.

December 1908

The average precipitation for the Territory was largely in excess of the normals. In the northern counties snow fell on the 3rd, and there was alternating rain, sleet, and snow from the 14th to 17th. Rain occurred in the southern counties on the 3rd, 14th to 16th, and on the 26th. The area of greatest precipitation covered the Bradshaw, the San Francisco, and the Mogollon ranges, the amounts ranging from four to seven inches. The heavy rainfall of the 15th and 16th caused some damage from washouts in Navajo and Coconino counties.

March 1912

The month was cold and stormy. The greatest monthly amounts of precipitation were reported from stations in the central and south central portions of the state. Reporting stations throughout the state, however, almost without exception recorded monthly amounts of from two to four times their respective monthly averages. A general storm on the 9th and 10th contributed largely to this excess although there were an unusual number of lesser storms during the month.

July 1914

The month was chiefly notable for the frequency of showers at elevations above two thousand feet and for the prevalence of an unusual amount of cloudiness at lower levels in the southwest.

A comparison of the July records for the state for the last eighteen years shows that there has been no preceding July on record with so many rainy days and so few clear days even though in most years the temperature has held higher than that of the current month and in two instances the rainfall has been greater.

December 1914

The excessive precipitation was the most notable feature of the month's weather, the monthly average for the state never having been equalled in December during the eighteen years of authentic record and having been exceeded only four times in other months during the same period.

Two general storms occurred during the first half of the month. The first important snowfall of the season in the mountain districts came with the storm of the 1st and 2nd. From the 17th to the 24th, inclusive, rain or snow fell every day over the greater part of the state, and this, together with another heavy rain on the 27th with intervening unsettled weather, constituted the most protracted and excessively stormy period that has occurred in Arizona for many years. Floods resulted in the various streams, dry beds, and washes of the southern half of the state, causing considerable damage to bridges and to the diversion dams of the smaller irrigation projects.

December 1915

Precipitation was about twice the normal amount. The excess was attributed to the heavy amounts that occurred in the storm at the end of the month. Periods of stormy weather lasting two or three days began on the 4th, 14th, and 29th. In the central part of the state, the storm of the 29th through 31st was one of the heaviest that has ever occurred. New records of heavy snowfall were established at many places in the Verde and Agua Fria watersheds. At Flagstaff, several poorly constructed buildings collapsed from the weight of the snow. During and following the storm, there was great difficulty in moving range stock to places with feed and shelter, but no serious losses were reported.

January 1916

January 1916 will go on record as the wettest month since the establishment of the Arizona climatological service in 1892. Moderate winter temperatures prevailed throughout the month except during the storm periods when some of the nights were unusually warm. Storm conditions prevailed continuously from the 15th to the 21st and from the 26th to the 30th.

Because the ground was saturated from the melting of the December snows, the series of heavy rains beginning on the 15th caused general flood conditions throughout the state from the 17th to the 24th. The storm beginning on the 26th caused more floods from the 28th to the 31st. According to reliable sources, the highwater marks of the Salt and the Gila rivers this January have not been exceeded since 1891. Four lives were lost. The property damage sustained is estimated at $305,000, the principal items of loss being bridges, irrigation works, and agricultural land. Traffic over the various railroads and stage lines was interfered with and in some cases was entirely suspended.

September 1916

The rains of the 8th and 9th were excessive on the uplands bordering the Salt River Valley, and the resulting floods broke the main canal and flooded a portion of the Project. The damage to the canal system amounted to about $10,000, while the direct loss to the farmers occasioned by the washing of newly planted crops and by the injury to hay and cotton from the heavy rains was undoubtedly much greater.

July 1919

The outstanding feature of the weather for July 1919 was its record-breaking rainfall. Thunderstorms accounted for practically all of the rainfall, which in a number of cases approached the dimensions of a cloudburst. Amounts in excess of 2.0 inches in twenty-four hours fell at sixteen stations. Benson (Cochise County) reported 2.43 inches in less than one hour. The heavy rains washed out roads badly and caused heavy

loss to railroads from wrecks, bridges destroyed, and track washed out. Some damage to irrigating systems was reported on the San Pedro River. The Salt River and Tonto Creek, flowing into Roosevelt Reservoir, showed the remarkable runoff of 215,380 acre feet during the month, Tonto Creek being higher than at any time last winter or spring. The Gila River also reached the highest stage of the year.

November 1919

The outstanding feature was the heavy precipitation. While falling far short of the state average of 5.22 inches recorded in November 1905, it was exceeded only by that month during the last twenty-three years. The daily falls were remarkably heavy for November, several stations recording more than 4.0 inches for the twenty-four-hour period.

The heavy rains of the 26th and 27th resulted in an unusual rise for the season in the streams of the north central counties. The Hassayampa attained a stage of five feet at Wickenburg on the 27th, and the wagon bridge at that place was carried away by the force of the water backed up by the accumulation of debris. Eight feet was reached on the same day in the Agua Fria at Marinette, and bridges at Avondale were carried away. A stage of 12.5 feet was attained by the Salt River at Phoenix on the 28th. Warnings were issued to points on the Gila; and the rise, as was forecast, reached Yuma on the morning of the 30th.

February 1920

Except over the southeastern portion of the state, precipitation was decidedly above normal. Two general storm periods are to be noted: from the 7th to 10th and 19th to 23rd, the latter yielding much heavier rainfall. High water in many streams resulted from the storm of the 19th to 23rd and caused much damage to roads and bridges. The loss to the state highways alone was placed at $342,000. For the first time in four years, on February 17, the water reached the level of the waste weirs.

August 1921

Excessively heavy rains throughout the mountain regions of the state continued from the latter part of July with little abatement until the close of August when they ceased as abruptly as they had begun. Channel water continued in the Gila over most of its length, preventing crossing except at bridges. Many floods occurred, owing to excessively heavy local rains. The most noteworthy occurred on the 21st from the usually dry channel of Cave Creek. Ashdale Ranger Station reported 6.25 inches in two days. This flood washed out the irrigation ditches and overflowed about four thousand acres of cultivated land, causing an average damage of about $10 an acre. The basement of the Capitol was flooded and the first floor was covered by several inches of water. The total damage, including crops, irrigation ditches, equipment, loss of records, damage to homes, etc., is estimated at $240,000.

August 1922

A heavy rainfall on the 2nd in the Chocolate Mountains north of Yuma caused three serious breaks in the main canal of the Yuma irrigation project, which cut off the water supply in the irrigation ditches in the Yuma Valley for about ten days. The storm also occurred in Mohave and Yavapai counties where small bridges and culverts were washed out and highways were somewhat damaged.

September 1923

While there were not many rainy days and the mean precipitation for the month was not unusually large owing to the deficiencies in the southeastern and extreme northwestern portions, the fact that most of the rain occurred almost continuously from the 16th to the 18th and was particularly heavy in the north central and northeastern portions caused many washouts in the highways and railroads in that section. The rains were particularly bad in the vicinity of Cosnino and Holbrook. One man drowned near the latter place, and much property was damaged. Trains were delayed and had to be rerouted. A serious train wreck in which four men were killed was indirectly due to the heavy rain.

November 1923

November was a mild month, neither very warm nor very cold. The outstanding feature was the large amount of precipitation that fell, especially on the 9th and 10th and again on the 16th and 17th. Phoenix had a twenty-four-hour rainfall of 2.40 inches on the 9th and 10th. This was the greatest twenty-four-hour rainfall on record at this station with one exception, July 1 and 2, 1911, when 4.98 inches fell in the twenty-four-hour period.

September 1925

On the 15th, general rainstorms accompanied by thunder and high winds overswept the state and lasted until the 19th. Many highway washouts occurred in southwestern Arizona; highways were rendered impassable near Florence where minor crop damage occurred. The Winkelman branch of the Southern Pacific was washed out as was the United Verde extension railroad. The Eastern Canal near Gilbert, Queen Creek near Chandler, and the San Carlos canal near Florence overflowed. The bridge four miles from San Carlos was washed out, delaying the Southern Pacific train for four hours. The Gila River crossing at Gillespie Dam was closed to traffic for three days because approximately 4.5 feet of water poured over the apron of the dam.

September 1926

On the 26th and 27th, one of the most damaging rainstorms in Arizona history swept over central and southeastern Arizona and extended as far south as central Mexico and as far east as El Paso, Texas. Excessive rainfall lasting in many instances for forty-eight hours occurred. The Southern Pacific Railroad suffered from damaged roadbeds, washed-out bridges, and suspended traffic west of Douglas from the morning of the 27th to the afternoon of October 1 and between Phoenix and Maricopa on the 27th and 28th. The Agua Prieta River ran half a mile wide, submerging bridges and highways. The Gila River was above flood stage at Kelvin.

On the 30th, the crossing at Gillespie Dam was closed, with water four feet deep on the crest of the dam. It remained closed for three days. Thatcher, Nogales, Douglas, and Safford were flooded and many adobe houses crumbled. The Southern Pacific Railroad placed its damage at $375,000. Camp Little at Nogales was damaged to the extent of $12,000 by the rains. Bisbee reported the heaviest monthly rainfall ever known there--10.19 inches. The State Bureau of Highways placed the damage to improved roads and small bridges at $60,000.

September 1927

Heavy rains were general from the 11th to the 13th, culminating in the first severe autumn flood of the season. One death at Coolidge Dam, serious damage to the Verde supply and intake system of the Phoenix waterworks, railroad tracks washed out between Pima and Central and also between Kelton and Pearce, the overflow of many rivers, streams, and washes, and a rise of six feet in the Gila River at Ray Junction resulted from the storm.

July 1928

A flood occurred at Miami on the 27th, doing about $300,000 damage to property. A wall of water swept down Miami Wash from the Pinal Mountains and spread out over the town, demolishing houses and uprooting trees. The business section of Miami was under four feet of water at the crest of the storm.

September 1929

From the 19th to the 24th, damaging wind and rain storms and flood waters occurred in south central and southeastern Arizona. The prison at Florence was damaged by wind and rain. A flood in the Little Colorado isolated the Leupp Indian agency, and a cloudburst occurred between Safford and Pima. Highway 80 east and west of Douglas was washed away in places. Benson was marooned by washouts on railroads and highways, and traffic was

delayed forty hours. A group of four men was struck by lightning at Nogales. Damage to roads, culverts, and bridges was estimated by the State Highway Department at $50,000.

August 1930

Damaging floods from small streams occurred in southeastern Arizona during the first ten days. Heavy rains fell in the mountains south and west of Nogales on August 1, and unusually heavy downpours occurred in the same places on the 7th and 8th, resulting in a general flood in Nogales, Arizona. Due to the rushing waters during the storm and accumulated water and mud after the storm, Nogales, Sonora, Mexico had a loss of four lives on their side; and, Nogales, Arizona, where the business section was flooded, suffered damages to the extent of $20,000. Many adobe buildings collapsed, and much damage was done to stores and residences.

February 1931

Heavy rains fell in all sections except over the Little Colorado and Rio Puerco (limited drainage areas in northeastern Arizona) where only moderate showers fell. Most of the precipitation was in the form of slow, soaking rains with snows only in the central and northern highlands. As a result of the heavy rains on the 11th to 16th, flash rises occurred in the Gila River and its tributaries. The Salt River rose 6.2 feet on the 15th and continued above flood stage (5.0 feet) on the 16th. Most of the water came from the Verde River as the water from the Salt River was diverted to the storage dams. The San Pedro River rose to 6.5 feet at Kelvin on the 16th. Two men were drowned in the Verde River when their boat overturned. Unusually heavy rains at Wellton near Yuma were followed by a rush of water from a "wash." A trestle and part of the roadbed of the Southern Pacific Railway were carried away with a loss of $30,000 resulting. One woman was drowned near Wellton, and many marooned tourists suffered from exposure and lack of food.

August 1931

Several heavy showers fell in practically all parts of the state. Especially heavy rains during the first week over the San Pedro watershed caused flood stages at Kelvin on the 10th. The Gila, Tonto, Agua Fria, Hassayampa, and New rivers ran unusually high. A heavy rainstorm at Continental, twenty-eight miles south of Tucson, inundated the village, and the Tucson-Florence Junction road was impassable. Over twenty-two motorists were marooned at Wittmann.

December 1931

The heavy rains and snows over the Salt and Verde watersheds resulted in a marked increase in the water contents of the chief reservoirs of the state and in a stored water supply ample for the coming season. The heavy snows and low temperatures brought exposure and suffering to the nomadic Indians of the eastern highlands, but no fatalities were reported. Snow drifted badly on the 9th and 10th in the Jerome section and in Navajo and Apache counties. Many sheep were lost in the Ganado section. Traffic was delayed by snow drifts for a day or two on the highland roads.

July 1932

On July 8th, floodwaters rushing down from the Mexican watershed of Sonora inundated the two border cities of Nogales to a depth of four feet, crumbling adobe buildings, flooding homes and business houses, overturning and demolishing automobiles, and tearing down the boundary fence separating Mexico from the United States. The estimated damage was placed at $75,000. The torrent of water demolished a large oil tank and seventeen thousand gallons of oil floated throughout the city. The estimated damage was placed at $75,000.

October 1932

The Yuma Weather Bureau reported the heaviest October rainfall on record, 3.39 inches. The rains fell mostly near the end of the first decade of the month and near the beginning of the last decade. The heavy rains in the vicinity of Yuma on the 6th and 10th did not damage crops as much as was at first feared; clear, drying weather in the wake of the storm prevented any great loss.

January 1933

The month was the third coldest January in fifty-nine years with a mean temperature of 39.0 degrees, 3.8 degrees below normal. At the close of the month, precipitation averaged 1.98 inches, 0.82 of an inch above normal. Heavy snowfall in the uplands resulted in a snowfall average of 7.6 inches. Precipitation was heavier than a year ago on the Verde drainage area and the Salt drainage area by 1.96 inches and 1.0 inch, respectively. A storm on the night of the 20th brought the first measurable snow since 1919 to the Salt River Valley. Yuma was the only county not reporting snowfall during the month.

August 1934

Local cloudbursts caused enormous amounts of erosion, especially in the extreme northeastern sections. In the southeast, along the Gila River, one of the worst floods in thirty years drove many residents from Duncan, swept away livestock, and halted both railroad and highway traffic. Damage was conservatively placed at $15,000. The Globe-Miami area was hit by a costly flood on the 27th which damaged stores and homes to the extent of approximately $20,000.

August 1935

Rainfall was above normal in practically all sections. Some exceedingly heavy falls were recorded at various stations. The heaviest was at Santa Marguerita where 4.10 inches occurred in about an hour and a half on the 22nd and a total of 9.09 inches fell during the month.

The heavy rains resulted in numerous floods and flash rises of the ordinarily dry washes which caused considerable loss of life and property. On the 22nd and 23rd, torrents of water poured through the Wickenburg area, damaging several houses along the Hassayampa River, cutting away portions of the highway and railway, and damaging bridges so that all travel was delayed more than twenty-four hours. On the 28th, a transcontinental bus was hit by a wall of water at the Dragoon underpass near Willcox, and five lives were lost. On the 31st, flood waters inundated sections of the Rillito Valley, and on the same date considerable damage was also experienced at Helvetia and at other localities between Tucson and Nogales. Property loss was estimated at $30,000.

July 1936

Storms did considerable damage to all forms of property. On the 17th, a hail storm at Jerome injured crops, and on the 24th, a hailstorm at Salome did unusually heavy damage to all crops. The storm of the 25th was far more widespread, covering central Arizona and extending into southern Arizona where there were heavy rains. Railroad tracks were washed out interrupting through traffic. Casa Grande and Gilbert were flooded, with water entering stores. Phoenix, Mesa, and other towns had water standing in the streets, sewers being unable to take care of the downpour. Irrigation canals in the Salt River Valley broke their banks and flooded several hundred acres of farmlands, ruining crops and killing small farm animals.

January 1937

The average snowfall for the state, 11.9 inches, was the greatest on record for any month excepting December 1915 when an average of 12.6 inches was obtained. The average for the northern section was 22.8 inches; for the southern section, 5.6 inches. The fall at many stations was the greatest

on record. The greatest monthly amount was 70.5 inches at McNary. Nineteen stations reported 30.0 inches or more for the month. Highways were choked by snowdrifts which suspended automobile traffic in almost all of the northern portion of the state and in a considerable portion of the southern section. Many motorists marooned on the highways were rescued with difficulty. The roof of the National Guard armory building at Prescott caved in under the weight of snow. Thousands of sheep and cattle perished in the blizzards which swept the northern part of the state.

February 1937

Precipitation for the entire state was only 8 percent above normal, but the north central portion experienced very heavy rain and snow. For a short time, flood conditions were reached in central Arizona streams as a result of heavy rains on the 6th and 7th. Virtually dry stream beds were rapidly filled and huge quantities of water poured into storage reservoirs. Damage resulted at Parker where the Bush pontoon bridge was destroyed when hit by a small bridge torn loose upstream; loss was estimated at $20,000. An estimated $27,000 loss also occurred at the Bartlett Dam site on the Verde River where two small bridges, a storage shed, and several trucks were washed away. A gas line in the Salt River bed near Phoenix was undermined by water and broken, resulting in a loss of about $5,000.

March 1938

Precipitation was 139 percent above normal for the northern section, 74 percent above for the southern, and 112 percent above for the state. Wettest periods were the 1st through 5th, 12th through 24th, and 27th through 30th. On the 3rd through 5th, floods on the Gila, Salt, and Verde rivers, on Oak Creek, and on various other smaller creeks and washes did a total damage in the state estimated at $248,228.

September 1939

The average rainfall of 3.82 inches was 2.52 inches above normal and was the greatest September average on record for Arizona. Unusually heavy rains in the western half of the state from the 4th to the 6th and from the 11th to the 13th, together with more moderate amounts during the latter part of the month, exceeded all previous records for the total monthly amount at seventeen stations. New records for greatest twenty-four-hour amounts were set at seven stations on the 4th, 5th, or 6th. At thirty-eight stations practically all of which are located west of the 112th meridian, new records were established for greatest total September precipitation. Heavy runoff occurred on the Bill Williams River and in many smaller streams in western Arizona. Runoff on the Verde River above the new Bartlett Dam amounted to 82,930 acre feet.

September 1940

The average rainfall for the state of 2.75 inches was 1.42 inches above the normal and was the greatest on record for September, with the single exception of 1939. The heaviest amount recorded in the state was 7.43 inches at Truxton, with all other stations in the northern division reporting above normal precipitation.

On the 6th, an unusually heavy rain at Moccasin, 18 miles west of Fredonia, flooded fields and homes and buried crops under more than a foot of sand. Heavy rain was recorded at Truxton on the 2nd, 13th, and 17th; 3.32 inches on the 17th equalled the record for that station which was set in 1939 and was the heaviest twenty-four-hour amount in the state for the month.

September 1941

The storm of the 28th and 29th brought heavy rains on the tributaries of the upper Gila River above Coolidge Dam and resulted in one of the worst floods ever experienced in Duncan and vicinity. There was also high water in the Safford area. The crest of the flood reached Duncan on the evening of the 29th, inundating a large part of the residential areas and farmlands. Damage to crops and homes and farmland along the Gila River from Duncan to Coolidge Dam was conservatively estimated at nearly $500,000.

August 1943

One of the heaviest rains of record in the Salt River Valley and its vicinity resulted in considerable damage on August 2nd and 3rd. The rains came in the form of heavy thundershowers, Granite Reef Dam reporting 5.12 inches in less than forty-eight hours. The Arizona and Grand Canals were filled to overflowing and within a few hours the rush of waters down the washes from the desert lands above breached the Arizona Canal in a number of places. Huge sheets of water overspread farm and residential areas to a depth of from 0.5 of a foot to 2.0 feet or more. The U.S. Soil Conservation Service estimated the damage to farms, livestock, residences, household goods, etc., at approximately $100,000. The County Engineer for Maricopa County estimated the damage to highways and related structures at about $15,000, while the Salt River Valley Water Users Association estimated damage to irrigation canals, etc., at about $30,000.

September 1944

During the period September 23rd to 26th, inclusive, a series of small but intense local thunderstorms occurred on the slopes of the Graham and Gila mountains and in the vicinity of the towns of Safford and Thatcher. At the Weather Bureau cooperative station at Safford, a total of 3.67 inches of rain was recorded for the storm. Other measure-

ments indicate that the storm totalled 4.69 inches at Hawk Hollow on the Fry Mesa Road and 7.65 inches in the town of Thatcher. This intense rainfall with a high runoff caused severe local floods south of Safford and in the town of Thatcher on Monday the 25th, causing extensive damage to canal systems, county highways, city water works, growing crops, farmlands, and other tangible property. Late estimates placed the total damage at about $700,000, the greatest damage being in and around the immediate vicinity of Thatcher.

August 1945

On August 9th, a storm of cloudburst proportions filled the banks of an ordinarily dry wash in Pima County to overflowing. Flood waters rushing down this dry wash tore a fifteen-foot gap in a bridge on the highway approximately four miles south of Tucson. Four automobiles plunged into the raging torrent, and ten persons were drowned, while four others struggled out of the flood waters. In addition to the loss of life, there was monetary loss which, according to the best estimates available, exceeded $26,000.

On August 17th, a storm at and above Clifton resulted in rock slides and mud slides on mountains surrounding the town. The heavy rains washed huge quantities of mud and rock down through the main part of town. Water and silt covered downtown streets to a depth of two or three feet, and many stores were flooded, causing great loss to the stocks of goods. Automobiles parked on the streets were almost buried in the mud and rocks. It was estimated that damage to highways, streets, buildings, stores, merchandise, automobiles, etc., totaled around $150,000.

August 1946

On the evening of the 2nd, an unusually intense thunderstorm hit the Phoenix area. Wind, rain, and lightning damage was estimated at $100,000.

The next evening (the 3rd), heavy rains and thunderstorms hit the mining town of Miami. Most of the damage resulted from silt, mud, and rocks being washed onto the highways and into business houses and homes. Automobiles were stranded and buried in mud. Damage was estimated at $21,000. On the same evening, a highway bridge in the vicinity of Cortaro was washed out. Damage was evaluated at $8,000.

August 1947

Following the driest first seven months of the year in the fifty-three years of climatic history, above normal precipitation visited the state during August. Average precipitation for the state as a whole was 3.2 inches. This is the greatest amount of monthly precipitation for Arizona since December of 1940 when 3.56 inches was recorded. These rains were well spaced and little damage occurred.

August 1948

On the 5th, Wickenburg was visited by a thunderstorm with heavy rain which caused damage estimated at $100,000. Flood waters in the Hassayampa River and in a tributary just north of town damaged buildings on low ground adjacent to the river. Part of the damage was caused by high winds.

On the 6th, a thunderstorm and heavy rain with hail caused damage estimated at $25,000 to roads and mine installations in the vicinity of Crown King. Three and one-half inches of rain fell in one and one-quarter hours by gague measurement at Crown King. The center of the storm and the heaviest rain was to the north of the station. Large trees were washed down the hillsides by flash floods and cuts up to fifty feet deep and two hundred feet wide were washed in roads.

January 1949

Precipitation during the month averaged 3.06 inches for the state, which is the most abundant for January since 1916. In fact, on only three occasions has this amount been exceeded since 1895. Precipitation was above normal over the entire state except over a small area along the upper reaches of the Little Colorado River Valley. Precipitation was the most abundant in the north central mountain regions from the Mogollon Rim to the Bradshaws and northward to the Grand Canyon. This area also received a tremendous snowfall, which was not only record-breaking for the month, but at many stations was one-quarter to one-third more than the former record. This fact was true for Flagstaff, Grand Canyon, Prescott, Williams, and Jerome. After the storm ending January 25, snow on the ground reached a depth of approximately five feet at many of these stations. In the Navajo country, a record snow of forty-one inches fell during the month. Drifts in the mountains near that point were reported to be from three to four feet in depth. In the White Mountains, Alpine with seventy-eight inches of snow received about twice its former record established in 1916. Southward near the Mexican boundary, the Mule Mountains received a heavy snowfall, with Bisbee reporting nearly twice its former record January snow.

Warm rains on the upper reaches of tributaries of the Gila River on the 13th caused melting of a considerable snow cover. The resultant heavy runoff caused minor floods on the Gila in Arizona with peaks on both the 14th and 15th. While considerable flooding of farmland occurred in the Duncan and Safford areas, the benefits from silting and increase in soil moisture probably outweighed some of the crop damage. Major damage to rural property was to fences in river bottoms and to young alfalfa and oat crops.

October 1949

Precipitation over the state averaged 1.15 inches for the month. Most of this fell during the period of the 15th throught 19th. A record October snowfall accompanied the storm. Seven inches of snow at Flagstaff was the heaviest fall ever recorded at that station in October. From ten to thirteen inches of snow was reported from higher elevations in the state. Greatest precipitation fell in the Bradshaw Mountains, in the Oak Creek and Flagstaff areas, and along the Mogollon Rim.

July 1950

Precipitation averaged 3.02 inches for the state, or 0.94 of an inch above normal. This was the greatest July average since 1930, and, for many individual stations, the greatest since 1921. The first area of greatest precipitation was the southeastern section comprising Pima, Cochise, and Santa Cruz counties. Several stations in that area recorded approximately double the normal precipitation. The greatest amount recorded in the state was 11.08 inches at San Rafael Ranch. The second area of abundant precipitation encompassed the western portion of the Mogollon Rim in the Payson area and also the area from the Bradshaws to Prescott. Prescott Airport, whose total was boosted by an unusually heavy thundershower on the 17th, recorded 9.61 inches for a monthly total. Another unusual total, although less spectacular, was at Yuma where 2.72 inches was the greatest July total since the station began in 1870. There was rain throughout a considerable portion of the state almost every day except during the period from the 10th through the 15th. Periods of most general rainfall were from the 5th through the 9th and from the 16th to the 24th.

April 1951

Precipitation averaged 1.42 inches for the month, an excess of 0.77 of an inch above normal. This was the greatest April precipitation since 1941. Heaviest amounts occurred in the north, east central and southeast portions. Over 3.0 inches of rain fell at stations along the Mogollon Rim, at a few stations west of Prescott in the Bagdad area, and in the mountain areas south and east of Tucson. The greatest amount reported was 5.96 inches at Junipine.

July 1951

During the evening of the 27th, a series of severe thunderstorms accompanied by high winds covered the Salt River Valley from the Bradshaw Mountains to Chandler and from the Phoenix-Tolleson area to Buckeye. Flash floods coursed down most washes with lowland flooding concentrated along river bottoms from Tolleson to Buckeye. Flash floods inundated portions of Litchfield Park. At Luke Field, it was

necessary to evacuate fifty families when water rose in the housing area. Highway 80 was closed between Buckeye and Gila Bend due to rising waters. The Southern Pacific railroad tracks were washed out in a number of places between Buckeye and Liberty by floodwaters from the Hassayampa River. Most of the land flooded was desert although about five hundred acres of cotton land were also flooded. Canals and ditches were extensively damaged by flash floods, and county roads were washed out where they crossed river bottoms without bridges.

August 1951

A tropical hurricane entered the mainland of Mexico from the east near Tampico on August 22nd. Moist air associated with this storm crossed Mexico to the eastern Gulf of California coast. This moist air began flowing into southwestern Arizona during the 26th. By mid-afternoon, widely scattered moderate to heavy thunderstorms were reported in the lower Colorado River Valley and in the central mountains. By the morning of the 27th, rainfall had become quite general over southern and central Arizona. The main influx of moist air entered the state in the vicinity of Organ Pipe Cactus National Monument. Heavy rain spread northward and northeastward into the Bradshaw and Mazatzal mountains. The rainfall area extended slowly northward after the 27th and spread to the northern border of the state by the 29th. Amounts continued moderate to heavy from the 27th through the 29th. Rain on the 30th was confined to the extreme north and east portions of the state.

Flood conditions developed in the flat lands around Litchfield Park and in the low lands along the Gila River from its confluence with the Agua Fria and Hassayampa rivers to Gila Bend. Flood waters in the Litchfield Park area were due in part to sheet flooding from precipitation on the desert floor and runoff from the White Tank Mountains to the west. Water rose as high as three feet in parts of the Litchfield Park-Goodyear area. It was necessary to evacuate several families from adjacent housing projects due to rising waters.

The town of Gila Bend was isolated from motor travel early in the storm due to water in unbridged washes on all highways leading to the town. Farther down the Gila River, the highway to Roll was washed out. Many county roads in addition to the main highways were damaged severely. About seventy-five hundred acres of agricultural land were inundated, mostly in Maricopa County.

An accurate appraisal of the storm damage was very difficult. Approximate figures include: damage to public roads, bridges, etc., $382,000; to agricultural products, $140,000; to railroads, irrigation canals and levees, $193,000. Other damage was sustained by public utilities. A preliminary estimate of the total damage was $786,000.

July 1953

Precipitation averaged 2.88 inches, or 1.21 inches above normal for the month. This was the heaviest July precipitation since the record-breaking rains of July 1950, and, for some areas of the state, amounts this year exceeded those of July 1950. The most outstanding area in this respect was the northeastern plateau where July precipitation amounts were the greatest for many years. For Springerville, this was the greatest July total since 1933; for Holbrook the greatest since 1929; and for St. Johns the greatest since 1921. At Kayenta, it was the greatest July total since records began in 1915. At Tucson on the afternoon and evening of the 14th, a thunderstorm with heavy rain damaged power lines and transformers. Flood waters eroded streets, broke the gas main, and damaged homes and stores. Estimated damage was $350,000.

July 1954

On the evening of the 20th, a thunderstorm with heavy rainfall occurred at Miami. Due to the suddenness of the storm, flash flooding piled up cars parked in the streets and destroyed many of them. Wind, water, mud, and debris caused damage to business installations. Total damage was estimated at $150,000.

At Globe, on the evening of the 29th, thunderstorms created a flash flood which caused a major disaster in a short period of time. Heavy rain in a narrow canyon south of town combined with heavy rain in Globe itself sent a wall of water down Pinal Creek, which flows parallel with a portion of the business district. Water rose to a height of several feet in business houses, broke windows, and swept merchandise and furnishings out of the buildings and down the creek. New cars were forced out of show rooms and destroyed in the flood. The greatest damage was caused in two blocks where twenty-five business buildings were destroyed. Forty others were damaged. Some merchants lost practically their entire stocks. One hundred and twenty-six families suffered loss. Damage was estimated at $1 million.

August 1954

By far the most costly storm of the month occurred on the 19th and 20th in the eastern portions of the Salt River Valley and adjacent mountains. Heavy rain occurred on the morning of the 19th in the Superstition Mountains and in other mountains to the south of the Superstitions. Rainfall ranged from four to six inches in a few hours. Flash floods filled washes in the desert areas to the west. Queen Creek, normally dry, ran at flood stage. Flood waters breached irrigation canals in the southeastern portion of the Salt River Valley Project and overflowed farm and residential areas. Additional showers

on the morning of the 20th increased the flooding. The small community of Gilbert was heavily flooded. Homes and stores around the desert community of Apache Junction were severely flooded, and a railroad trestle in Superior was damaged. It was estimated that thirty thousand acres of maturing cotton from the communities of Queen Creek to Gilbert were damaged by flooding. Damage was reported to roads and ditches also, and total property damage was approximately $445,700. Damage to crops, mainly cotton, was estimated at $1.4 million.

July 1955

On the 24th and 25th, heavy rains over the south central portion of the state sometimes totaled three to four inches for the two-day period. There was considerable flooding of dips and washes. On the 25th, a canal near Florence broke, allowing water to the depth of three feet to run down the main street. Damage to the canal system was estimated at $24,000 with an additional $25,000 damage to roads and highways. Cotton and other crops were buried in one to three feet of water and silt, and considerable water damage to business houses and residences occurred.

October 1956

On the morning of the 23rd, heavy rains fell over a narrow strip of territory running from Litchfield Park through Cave Creek and ending in the Rim country northeast of Payson. The width of the path of heaviest rains was about twenty miles in the Litchfield Park area but widened in the mountains of the Rim country to about fifty miles. Locally strong winds also associated with this storm did some damage to roofs in residential sections. Most of the damage was caused by flash floods which occurred in the northwestern section of the Salt River Valley. Flood waters from Cave Creek poured into a gravel pit and buried a crushing plant under thirty feet of water. School children were stranded at Sierra Vista school, located about ten miles north of Glendale, but were rescued by nightfall.

July 1957

Heavy rains caused flooding of homes, stores, and farmlands in and near Safford and Thatcher on the morning of the 26th. Property damage was in excess of $100,000 and crop damage alone was $65,000.

October 1957

On the 14th, heavy rains in the Picacho area caused floodwaters to race through a labor camp flooding about fifty cabins and a dozen homes nearby. The Red Cross reported that about 250 migrant workers from the camp were homeless during the storm. Property damage was estimated at $20,000, and considerable damage was done to cotton by flooding of fields.

July 1959

On the 21st, heavy rain from thunderstorms in Tucson and vicinity caused about $50,000 damage to county roads by flooding and $25,000 to automobiles and home interiors by water.

August 1959

On the evening of the 3rd, $25,000 damage was done in Winslow by flooding due to thunderstorm rains.

On the 5th, heavy rains caused about $30,000 damage by flooding near the Arizona Canal in Phoenix. Damage was to homes and furnishings in north Phoenix.

In the early morning of the 11th, heavy rain in the Greene Reservoir area flooded cotton fields, doing $100,000 damage about five to ten miles south of Eloy.

On the afternoon of the 17th, heavy rains caused about $75,000 road damage within Pima County; and in Tucson on the evening of the 20th, an estimated $50,000 damage was caused when stores, warehouses, and homes were flooded.

October 1959

A major rainstorm occurred over the central and eastern counties on the 29th and 30th. While the storm brought precipitation to most of the state, heaviest amounts fell in the central and eastern sections. Preliminary estimates of damage were about $1 million to the state cotton crop due to downgrading, with an additional $2 million to property and roads. Seven people were killed and fifty injured during the storm.

December 1959

On the 24th and 25th, an intense storm brought heavy precipitation in the central part of the state. Water damage to highways in Maricopa County was estimated at $100,000. Flooding along the Gila River in Maricopa County was heavy.

July 1961

In Tucson on the afternoon of the 22nd, heavy rains associated with a thunderstorm caused about $30,000 damage to city streets. Heaviest damage was in the suburbs where many homes had roof and structural damage. Several cars were washed away in flooded arroyos. Damage also occurred at the same time in the Phoenix and Glendale areas where damage was heaviest in the northern and western sections. Heavy rains damaged residences, business establishments, and utilities. Several automobiles were washed down flooded arroyos. Damage in Phoenix was estimated at about $300,000, with an additional $25,000 damage in Glendale.

August 1961

An unusually heavy rainstorm hit the Tucson area about 9:00 p.m. on the 22nd, bringing over two inches of rainfall in one hour. The heavy runoff produced by the storm caused severe damage to roads and property. Water damage was as follows: about $100,000 to city streets and $200,000 to county roads; about $25,000 to personal property, most of which was to automobiles caught in flash floods.

August 1963

Thunderstorms were unusually frequent over most of the state during this month, and new rainfall records were set at a number of stations.

On the evening of the 16th shortly after 9:00 p.m., a thunderstorm moved into the Salt River Valley and intensified over the Glendale area where shortly before midnight it produced precipitation of very heavy intensity lasting into the early morning hours of the 17th. The Grand Canal overflowed its banks, flooding homes and business establishments in Glendale, Maryvale, and in northwest Phoenix. The Red Cross set up an emergency unit to aid families driven from their homes by the flood waters.

Two unofficial but reliable reports of more than five inches of precipitation were received for storm totals in the Glendale area.

With the soil still wet from the storm of the 16th, additional heavy precipitation on the evening of the 19th produced rapid runoff. Damage due to flash flooding was particularly high in southwest Prescott. Flood waters washed sewer lines so that about 75 percent of Prescott's sewage was carried away before reaching the disposal plant. As a result of the hazardous health situation and heavy local damage, the Governor declared Prescott a "disaster area." According to a reliable preliminary estimate, total damage by the combined storms of the 16th and 19th to streets, sewers, and private property was nearly $1 million.

New record rainfall amounts were 12.45 inches at Natural Bridge, 8.06 inches at Roosevelt, 11.03 inches at Superior, and 13.09 inches at Crown King.

September 1963

Remnants of tropical storm Katherine moved into western Arizona on the evening of the 17th, producing rainfall of locally heavy intensity. Heaviest property damage occurred in the Yuma area where 2.04 inches of rain was measured in one hour at the Weather Bureau Airport Station, an all-time record for the station. Highways were washed out, many automobiles were caught in rising floodwaters and suffered severe water damage, and many homes and businesses were flooded. Cotton and alfalfa fields were inundated, and most of the fall lettuce crop had to be replanted.

July 1964

At Flagstaff on the afternoon of the 30th, heavy rainfall associated with general thunderstorm activity over the northern mountains caused property damage to homes, utilities, and motor vehicles in excess of $50,000. Considerable damage was also caused to Flagstaff streets by floodwaters.

On the evening of the 31st over south central Arizona, thunderstorms caused damage over a wide area from Tucson westward to Ajo. Most of the damage in the Tucson area was to homes and automobiles due to flooding. There was considerable damage to farmland near Gila Bend. Isolation of Papago Indians by flood waters required an airlift of over one ton of food to about a dozen small villages near Sells.

August 1964

Thunderstorm activity concentrated mostly over the southeastern and south central part of the state caused heavy local runoff. Most of the area between Stanfield and Maricopa was flooded, causing damage to highways and some damage to farmland. Highway damage was also reported near Mesa. In the Douglas area floodwaters damaged roads, and high winds damaged roofs and utilities.

On the afternoon of the 12th over southeastern and central Arizona, scattered thunderstorms produced locally heavy downpours in some areas. Most damage was water damage to property, and only limited crop damage was reported. Casa Grande, Florence, and Eloy were heavily flooded, with most damage to homes, stores, and highways. Farther north, heavy rains drenched Winslow where runoff from surrounding mountains increased the flooding. All patients were evacuated from Winslow Memorial Hospital, and all highway traffic in the area as well as Santa Fe railway traffic was halted.

January 1965

In Maricopa and Pinal counties on the 5th, 6th, and 7th, heavy rains over a three-day period damaged about one fifth of the approximately 15 percent portion of the winter cotton crop which was still unpicked. Damage exceeded $500,000, with heaviest damage in Maricopa County.

December 1965

Precipitation during the month was much above normal in all sections of the state, but heaviest totals were reported in the mountains in the northern, central, and eastern sections, with another band of unusually heavy totals running southward through eastern Pinal and Pima Counties. After general precipitation over the state between the 8th and 18th, warming on the 20th through the 22nd produced snow melt and heavy runoff into the Salt and Verde systems. Additional precipitation on the 23rd produced more snow in the White Mountains and caused flooding in the southern part of the state along the Santa Cruz River and along the Gila west of Coolidge Dam. Finally, a warm rainstorm on the 30th and 31st melted much of the existing snow cover on the Salt and Verde watersheds, making necessary late on the 30th the release of about seventy thousand cubic feet per second of water into the Salt River from the rapidly filling dams upstream. The result was the worst flood in the Salt River Valley since completion of the reservoir system. All roads crossing the river in the Tempe, Mesa, Scottsdale, and Phoenix areas were washed out, and all bridges were at least partially damaged, creating the worst traffic jam in the history of the state. Damage to roads, utilities, farmlands, crops, livestock, homes,

and automobiles was widespread over most of southern Arizona, but adequate warning of the release of water made possible evacuation of people from danger areas.

In Pima and Pinal Counties several hundred acres of cotton and grain land along the Santa Cruz River were flooded, and Rillito Creek ruptured sewage lines, contaminating a number of wells in the Tucson area. Palisade Ranger Station in the Santa Catalina Mountains reported 89.0 inches of snow during the month. Largest precipitation values for the month were reported at Workman Creek (16.32 inches), Upper Parker Creek (13.96 inches), Pinal Ranch (13.59 inches), Kitt Peak (13.53 inches), and Palisade Ranger Station (12.64 inches).

August 1966

In Sabino Canyon near Tucson, heavy runoff from the Catalina Mountains caused considerable damage in the Sabino Canyon recreation area on the 10th.

In Phoenix and environs, unusually heavy rainfall caused heavy property damage in Glendale, Tempe, Deer Valley, and southeastern Phoenix on the 18th.

August 1967

On the 12th, Graham and Greenlee counties were affected by floods that caused considerable damage. Heavy rain began late on the 11th and continued on the 12th on the headwaters of the Gila and San Francisco rivers, causing flooding downstream. Floods damaged roads, utilities, homes, and businesses. Many farms were inundated, with heavy damage to fields, irrigation canals, and crops. Heaviest damage to both property and crops occurred in Graham County.

December 1967

During the period of December 12th through the 20th, one of the most severe snowstorms in the history of Arizona occurred at higher elevations over much of the state. During this nine-day period, some of the heaviest snow in the climatological history of the state brought widespread damage to Arizona. From a meteorological standpoint, there were actually two main storms; one affected the state from December 12th through 16th and the other from late on the 17th through the 20th. However, the storms followed one another so closely that many people were unaware that there were two storms.

Heaviest snowfall occurred in the mountains in the northern, central, and eastern parts of the state and on the high plateau area in the northeast. Because of the rapid rate of snowfall and the accompanying low temperatures, new records for maximum snow depth were set at many stations in those areas. Many homes, farm buildings, and business structures caved in from the weight of the snow. Considerable damage was incurred by utilities and roads. Many people were stranded and at least eight were trapped in the open and died of exposure. All of the latter were on the Navajo Reservation and in the northeastern part of the state.

Crop losses included losses to farm buildings, fences, and roads as well as the value of a number of cattle that died in the snow. Food supplies were airlifted into the region. Hawley Lake reported almost 103.0 inches of snow during the month. Greatest precipitation amounts were reported at Crown King (16.21 inches), Pinal Ranch (12.61 inches), and Tonto Creek Fish Hatchery (11.55 inches). In much of northeastern Arizona the temperature did not rise above freezing from midnight on the 12th through midnight on the 22nd.

August 1968

In Flagstaff, heavy rain on the slopes of Mt. Elden produced locally heavy runoff in east Flagstaff on the 2nd. Most of the damage was to streets and roads. Several homes were also flooded.

A storm began in the Globe-Miami area on the 3rd, with strong winds causing damage to homes and stores. Flood waters from locally heavy rains damaged streets and roads. Heavy rains continued on the 4th with additional flooding on that date.

September 1969

On the 14th from Poston to Ehrenberg, heavy rains did extensive damage to prepared agricultural lands and partially damaged the lettuce crop. Damage was estimated at $100,000.

March 1970

On the 1st, one of the heaviest March storms in many years hit the northern part of the state. Heaviest precipitation totals occurred in the San Francisco Mountains in the northeast division and along the Mogollon Rim in the east central division. Heavy amounts also fell at higher elevations in the north central division. The storm came largely as rain below about five thousand feet, but snow fell above that elevation with some locally heavy amounts.

The 26.0 inches of snow which fell at Grand Canyon National Park on the 1st was the largest daily fall in March in the climatological history of the station. (Records began in 1903.) The monthly snowfall of 36.0 inches at this station was the second largest total since records began. (The record was 43.5 inches in March 1952.) The daily precipitation total on the 1st at the station was 3.98 inches, which was not only a new March record but also a new record for any month. (The previous record for an observational day was 2.70 inches in September 1937.) The monthly precipitation total of 5.38 inches was also a new March record. (The previous record was 3.74 inches in March 1924.)

Several records also fell at Flagstaff, where the combined record began in 1898. The 26.0 inches of snowfall on the 1st was a new record in an observational day for March. The total monthly snowfall (67.3 inches) was also a new all-time record for March. A total of 6.75 inches of precipitation fell this month, which was also an all-time record for the month of March at this station.

Heavy precipitation also fell in Oak Creek Canyon just south of Flagstaff. Junipine, where records began in 1935, recorded 4.14 inches on the 1st, which was the second largest March total in an observational day (record 5.53 inches on March 3, 1938). This station also totaled 7.76 inches of precipitation for the month, which was the second largest of record for March. (Largest was 8.05 inches in March, 1938.)

Another long-record station in an area of heavy precipitation was Crown King in the Bradshaw Mountains, where records began in 1914. This station received 3.77 inches of precipitation on the 1st, which was a new record for an observational day for the month of March. (The existing record was 3.21 inches on March 23, 1954.) The monthly total (7.79 inches) was the second largest March total of record.

September 1970

Tropical storm Norma, located in the Pacific Ocean below Baja California, initiated a flow of moist tropical air over the Gulf of California toward the desert southwest on the afternoon of the 1st. This surge of moisture entered the state on the 2nd, overspread the state, and increased in depth during the next two days.

On the morning of the 4th, a convergent flow of air developed in the lower levels of the atmosphere in the Tucson area and south-southwestward to near Sasabe. This produced heavy precipitation along and east of the Baboquivari Mountains and northward to Tucson and the Avra Valley on that day. This heavy rainfall caused rapid runoff that washed out roads and several bridges near Tucson and flooded homes.

On the 5th, strong southerly winds developed over much of Arizona causing heavy orographic precipitation, with heaviest amounts along south slopes of natural barriers in the southern part of the state. Precipitation along and to the south of the Mogollon Rim in Gila County and along the south slopes of the Bradshaw Mountains in Yavapai County was especially heavy on the 5th. Severe flooding in Christopher Creek, Tonto Creek, and Sycamore Creek caused extensive damage to roads, bridges, and property along those tributaries.

Rainfall was also heavy in the Scottsdale area, where many homes were severely damaged by floodwaters. Flood damage in other parts of Maricopa County was scattered as far west as Wickenburg, where the Hassayampa River overflowed its banks and flooded residential areas. Flooding also occurred along the Little Colorado River from Winslow to the Navajo Reservation.

Agricultural damage was reported to range improvements such as fences, wells, stocktanks, and corrals. Loss of cattle was light, as was damage to field crops. By the 6th, precipitation was limited mostly to the mountains in the southeastern part of the state, but reported damage on that date was light relative to that occurring on the previous two days.

Storm rainfall exceeded 7.0 inches at Crown King (7.01 inches), Tonto Creek Fish Hatchery (7.12 inches), Kitt Peak (8.08 inches), Sunflower 3NNW (8.44 inches), Palisade Ranger Station (8.74 inches), Upper Parker Creek (9.09 inches), and Workman Creek (11.92 inches, 11.40 inches in twenty four hours).

August 1971

During August 1971, an unusually well-developed summer monsoon brought abundant moist air into the state on a consistent basis. This moisture caused widespread thundershowers over the state, producing monthly rainfall totals which were above normal in many sections. The monthly totals at some stations were great enough to set new records for the month of August and, in some cases, new records for any month for the entire period of record.

Prescott received 10.51 inches, the most precipitation ever received in August. Rucker Canyon (9.93 inches), Sabino Canyon (7.87 inches), Apache Powder Company (6.96 inches), Casa Grande (6.22 inches), and Chevelon Ranger Station (9.50 inches) also had record-setting rainfalls.

October 1971

October was a month of unusually cold weather over most of the state. Most of the records set during the month were low-temperature records, but a storm just after the middle of the month and another just before the end of the month brought unusually heavy snowfall for so early in the fall to higher elevations in the northern part of the state. The Weather Service Office in Flagstaff, which totaled 24.7 inches of snow for the month as a result of these two storms, received more snowfall during October this year than during any other October since the combined meteorological record began in September 1898. The previous record was 19.0 inches in October 1920.

December 1971

Heavy rains which melted several inches of snow cover caused heavy runoff, with considerable damage to roads, bridges, and dams. Principal damage was reported at Highway 160 at the Fools Hollow Crossing, the Porter Creek crossing on Porter Mountain Road, Billy Creek, Show Low Lake north of the dam, Clay Springs Road at Cottonwood Wash, Silver Creek east of Taylor, and in a subdivision in the Pinetop area.

June 1972

Heavy rains caused local flooding in the northeastern section of the Phoenix metropolitan area on the night of the 21st, and heavy wind damage occurred in northwest Phoenix where hailstones up to 1.5 inches in size were reported.

About 6:00 a.m. on the 22nd, a severe thunderstorm system developed southwest of the Phoenix metropolitan area and moved northeastward across northeast Phoenix and Paradise Valley. Very heavy rains in amounts up to more than four inches fell within a two-hour period. Severe flooding occurred on Indian Bend Wash and the wash that drains westward from the area between Camelback and Mummy mountains. Over eight hundred homes were damaged or destroyed. Irrigation canals were breached. According to the U.S. Department of Agriculture, between two and three hundred acres of cotton were destroyed by hail. At the National Weather Service Forecast Office at Sky Harbor Airport, hail measuring three-quarters of an inch in diameter fell at 7:25 a.m. MST.

Because of the relatively short time interval between the storms of the 21st and those on the 22nd, it was not possible to estimate the property damage on each day; instead, the Arizona State Division of Emergency Services made an estimate of the total property damage for the two-day period of $10,800,000.

August 1972

In Pima, heavy rain locally and in the surrounding mountains began before dawn and continued throughout the morning and afternoon. Flood waters breached canals and irrigation ditches, flooding a number of homes and businesses. Flood waters also caused considerable damage to roads and farmland in the area.

October 1972

Heavy precipitation associated with moist tropical air advected from tropical storm Joanne fell in much of the state. Meteorological conditions for advection of tropical air into Arizona from this storm were not established until the 4th. On the 3rd, a low-pressure center aloft situated over southern California brought moist maritime air and showers to much of Arizona. It was not until the 4th, however, that a strong southerly flow of air developed aloft to the east of this low-pressure center and began to bring moist tropical air into Arizona from Joanne. On that day, this storm was located about 430 miles west of the southern tip of Baja California at 5:00 p.m. MST.

The flow of tropical air into Arizona continued on the 5th as Joanne moved to more northerly latitudes. By 11:00 a.m. MST on the 6th, the center of Joanne was located about forty miles south-southwest of Punta Penasco (Rocky Point), Mexico, and the storm moved north-northeastward into Arizona during the afternoon. It is believed that this was the first time in the climatological history of the state that a tropical storm entered Arizona with its cyclonic (counter-clockwise) air circulation intact. Peak sustained wind speeds associated with the storm's passage, however, were in the neighborhood of only thirty-five to forty-five miles per hour. Nevertheless, abundant moisture in the tropical air brought unusually heavy rains to much of the state. At 8:00 p.m. on the 6th, the center of the circulation was estimated from surface data to be about fifteen miles west or west-northwest of Gila Bend. By 11:00 p.m. MST, it had moved to the 7000-foot Bradshaw Mountains south of Prescott, and at 3:00 a.m. on the 7th, the center of the storm passed almost directly over Flagstaff. Rains washed out numerous secondary dirt roads along the storm's path. One major highway bridge on U.S. 89 south of Tucson was lost, and additional damage was done to urban streets. Crop damage was much heavier than property damage, with heaviest damage due to rain in the Salt River, Santa Cruz, and lower Colorado valleys, where farmers incurred grade losses of up to $5 million on the cotton crop.

On the morning of the 17th, a broad band of tropical moisture began moving over Arizona from a southerly direction. This moisture was carried on a southerly flow of air on the east side of an upper-level low-pressure system off the California coast. This flow of moisture from the south intensified in the next several days and heavy shower activity was reported in much of the state. Precipitation fell over most of Arizona from the 17th through the 21st, with heaviest rainfall on the 18th and 19th. On soil

already heavily saturated from the heavy rains of October 3rd through 7th, amounts of rain up to about one inch were measured during the day of the 17th over west central Arizona. Lesser amounts were recorded over most of the rest of the state.

On the 18th and 19th, rainfall measurements of three to five inches were not uncommon along the Mogollon Rim and in the White Mountains. In addition, heavy amounts of rainfall were also reported from western New Mexico. Flooding was reported on the Verde River, the Little Colorado River, and on streams under and on the Mogollon Rim above Payson. However, by far the heaviest flooding occurred along the San Francisco and Gila rivers. The towns of Safford, Clifton, and Duncan suffered extremely heavy losses due to flooding. Nearly $8 million in property damage was caused, with most of this damage occurring in Graham and Greenlee counties. In addition, agricultural losses were heavy, preliminary estimates totalling $8 million in Graham and $2 million in Greenlee County. Damage to roads and highways in Maricopa County totalled nearly $100,000, according to preliminary estimates. Some deaths were caused by drowning.

November 1972

Phoenix Department of Public Safety reported hail the size of golf balls near Kingman.

February 1973

Strong winds accompanying a thunderstorm tore off portions of the clubhouse roof and the roofs of several barns at Turf Paradise racetrack. A number of plate glass windows were shattered by the wind and several racehorses were killed.

March 1973

This month ranks as one of the wettest and snowiest on record. Almost 40 percent of the weather stations in the state reported new precipitation records for the month. The largest amounts were Happy Jack Ranger Station (11.06 inches), Hawley Lake (11.00 inches), and Tonto Creek Fish Hatchery (10.34 inches). A new snowfall record for one month was set at sunrise (123.0 inches). In early April, record-setting measurements of snow on the ground were made (e.g., Mount Ord - 150.0 inches; San Francisco Peaks - 125.0 inches).

May 1973

One inch hail was reported in Phoenix in the general area of 91st Avenue and McDowell Road.

July 1973

Thunderstorms over central and western sections of Maricopa County caused lightning damage to palm trees, and heavy rain and wind caused minor roof damage and urban street flooding on the evening of the 12th.

The 1972-73 Water Year

Precipitation in the period from October 1972 to September 1973 resulted in the highest flows on record in many Arizona streams. These flows resulted from the melting of record-setting snowfalls in the mountainous areas of central and northern Arizona. As one example, when snow surveyors reached the inner basin of the San Francisco Peaks in early April, they found 125.0 inches of snow on the ground. The previous record had been 80.0 inches set in March of 1969. At Flagstaff a new record for annual snowfall was set when 174.0 inches were recorded. The melting of this snow combined with runoff from rains falling at lower levels filled the reservoirs of the Salt and Verde rivers; releases from the dams and reservoirs on the rivers flowed down the Salt and Gila to the Colorado River. The flow in the Salt River which continued for ninety-four days caused a great deal of inconvenience in metropolitan Phoenix where traffic across the river was limited to Tempe Bridge and the bridges on the I-10 freeway.

In contrast to the winter season, the summer months of June, July, August, and September were among the driest on record. Flow on the Little Colorado in September was 1 percent of normal, and, by September, flows in almost all of Arizona's streams were below normal.

July 1974

On July 19, a severe thunderstorm with winds up to eighty miles per hour and heavy rain caused extensive flooding in Lake Havasu City and completely washed out sections four and five feet deep in some streets. Many cars were abandoned during the storm and a number washed away. Three members of one family were carried to their deaths and one was injured when their station wagon was carried three thousand feet down a wash by a wall of water ten feet high.

Damage to public and private property amounted to $1.7 million. At Bullhead City over 2.0 inches of rain caused extensive flooding on the morning of the 20th. Thirty-two families were temporarily stranded at their homes, and six mobile homes were in jeopardy of being washed into Canyon del Oro Wash by runoff from a 4.75-inch rain. Runoff cut deep gouges in and washed away huge chunks of earth from driveways and county roads.

Again on the 21st and 22nd, thunderstorms caused flooding of streets and highways in the Salt River Valley. The Tempe-Chandler area was

particularly hard hit. The Apache Trail (State Highway 88) was closed due to washed-out and flooded sections.

August 1974

Extremely heavy rains and strong winds accompanied thunderstorms that hit central and eastern Arizona on the 5th and 6th of the month. Almost 4.0 inches of rain fell on the northwest side of Phoenix, causing flooding of streets and highways. On the afternoon of the 5th, a brief but vicious rain storm in which 2.40 inches fell in forty minutes caused massive flooding over much of Tempe and southeast Phoenix. Water eight feet deep accumulated in one underpass on the Black Canyon freeway and entered more than one hundred houses and numerous commercial buildings which were also damaged by wind. On the 6th, heavy rains of around 2.0 inches in three hours resulted in flash flooding of washes and creeks leading into Clifton in Greenlee County. Hardest hit was Chase Creek. Large stones and rocks, mud, and other debris covered a number of streets up to three feet deep. Three cars were buried.

September 1974

Heavy thunderstorm activity continued into September. On the 4th, between two and four inches of rain fell on Chino Valley, causing extensive property and crop damage. On the 21st, the south sides of Phoenix and Tempe were hit by heavy rain and wind. And, on the 25th, a thunderstorm with strong winds and heavy rain swept through Bullhead City, causing extensive flooding and some wind damage. A number of businesses were flooded with over one foot of water, and streets were covered with water, mud, and rocks. A number of cars were stranded in flooded washes.

October 1974

In Winslow, a torrential rain with marble-size hail driven by winds up to fifty-four miles per hour halted traffic, flooded streets, caused sewer back-ups, and piled up hail to a depth of three feet in some areas. The rainfall measured 2.09 inches in thirty-five minutes.

July 1975

In what has become known as the Bastille Day storm of 1975 (14th of July), the Sedona-Oak Creek Canyon area experienced one of the heaviest storms in its history. An intense downpour of 3.8 inches of rain with 3.5 inches falling in forty-five minutes (unofficial amounts) caused severe flash flooding of Soldiers and Mormon washes. Roads, houses, and trailers were flooded; retaining walls, culverts, and butane tanks were washed out. One car was carried 175 feet down a wash. Water was three

to five feet deep in one trailer park. Water also damaged a number of shops. Damage was put at $500,000 to private property and $10,000 to culverts and roads.

September 1975

Heavy rains over southeastern Arizona and southwestern New Mexico on the 6th, 7th, and 8th caused flooding of the Gila, San Francisco, and Blue rivers. Hardest hit was Clifton where the San Francisco rose to 2.5 feet above flood stage. Three hundred persons were evacuated from their homes on the night of the 8th. Water rose to a depth of 3.0 feet in streets on the north and east sides. All vehicles were removed, however, from the affected areas before the flood crested. Estimated damages were: public, $91,000; private, $275,000. The Governor declared a state of emergency for these areas on the 19th.

February 1976

Heavy rains of two to five inches falling on the 7th to 9th of the month brought floods to a number of the streams below the Mogollon Rim in Yavapai County. Especially hard hit were the Verde Lakes Estates near Camp Verde and Oak Creek Canyon.

July 1976

Heavy rains were general over much of the state on the 9th, 10th, and 11th in various parts of the state. The most damage occurred in the north and north west sides of Tucson where cars and trucks were stranded in three feet of water.

August 1976

Flooding occurred again in Tucson on the 22nd when a local thunderstorm brought heavy rain to the southwestern part of that community. Also on the 22nd a severe storm caused flood damage in Colorado City in Mohave County.

September 1976

Tropical storms brought unusually large amounts of precipitation to the state during this month. On the 10th, tropical storm Kathleen slashed through extreme western Arizona and southeastern California on its way northward. There was no flash flooding in the Yuma area, but Mohave County in Arizona and Imperial, Riverside, and San Diego counties in California were hard hit by the storm. The Yuma area, however, did suffer extensive wind damage with gusts reaching 76 m.p.h. Many power lines were down and much of the city was without power for several hours. Considerable damage

was done to trees, roofs, mobile homes, signs, and windows. One man was killed when a seventy-five-foot palm tree crashed onto his mobile home. Fallen trees and power-line poles blocked many streets. Six small aircraft suffered extensive damage and two parked semi-trailers were overturned. Produce crops, including citrus and pecans, received heavy damage, and large quantities of fruit were ripped from the trees by the wind. Estimates of damage in the greater Yuma area were $1 million to property and $1 million to agriculture.

On the 11th, tropical storm Kathleen with its torrential rains of two to five inches brought severe flash flooding to Mohave County. The hardest hit was Bullhead City and the surrounding area along the Colorado River. The area was devastated between the afternoon of the 10th and the morning of the 11th. Eight washes carried walls of water from elevations of over three thousand feet to the east into the Bullhead City area with an elevation of 675.0 feet. There was severe damage to streets, highways, residences, businesses, water and gas mains, and culverts. Many cars were swamped in tons of debris. Silver Creek Wash crossing Highway 95 was cut into a twenty to forty-foot-deep canyon by the raging water. The city was severed from all outside assistance. Estimates of damage to roads and streets were put in excess of $500,000 and damage to private property at $2,500,000. Bullhead City was declared a disaster area by the county supervisors on the evening of the 10th and by the Governor's office on the 21st.

On the 24th, Bullhead City was again hit by a severe storm. Heavy rains of two to five inches produced walls of water that inundated this community which was still trying to dig out from the millions of tons of silt, rocks, and debris from the devastating flood produced by tropical storm Kathleen. Highway 95, the only access to the outside, was again quickly inundated in several places. A number of cars, some with occupants, were swept down the washes. Eight persons were rescued, some by a private helicopter. Additional damage from this storm was estimated at $2 million to $3 million.

Other parts of the state also received large quantities of rain from this surge of tropical air. In Maricopa County violent thunderstorms with amounts of rain locally over two inches late on the 24th and early on the 25th triggered home-damaging mud and rock slides on Camelback Mountain. Numerous homeowners had to remove considerable debris from homes and yards. Dozens of roads and streets were closed. In the Scottsdale area many cars were either stranded in washes or carried downstream. People were rescued all through the night, but no injuries were reported. There was some flooding of homes and extensive water damage to a school and high school.

In Yuma County heavy thunderstorms deluged sections of the county late on the 24th and early on the 25th. There was considerable flooding of streets in the city of Yuma and of many low sections of highways in the county. A few residences were flooded in the city. There were a number of power outages due to lightning strikes. No injuries were reported.

In the Tucson area heavy thundershowers with intermittent hail rapidly filled the normally dry washes, especially the Pantano Wash and the Rillito River. Flooding occurred on almost one hundred streets and roads throughout the city, particularly on the north and east sides where local amounts of rain ranged upward to 3.5 inches. Nearly a dozen cars, some with occupants, were swept into washes on the east side. One man was missing and presumed drowned. Two boys were carried down the Rillito River 1.5 miles before they could reach ground after their car failed to cross the stream. The size of hail ranged upward to 0.75 of an inch diameter, with some as large as golf balls. Up to 5.0 inches of hail covered the ground in the Mt. Lemmon area. Only minor damage was reported. Winds of 40 to 50 m.p.h. blew out some windows in residences and businesses.

October 1976

On the 22nd and 23rd, heavy thunderstorms, with local amounts of rain of over 5.0 inches in twenty-four hours and nearly 6.5 inches in forty-eight hours, produced flash flooding in some sections with minor damage to secondary roads in Yuma County.

August 1977

On the 14th and 15th, tropical storm Doreen, with torrential rains of two to seven inches, brought floods to areas along the Colorado River in northern Mexico, Arizona, California, Nevada, and Utah. In Yuma County, two bridges were destroyed and twenty-five to thirty miles of roads and streets were damaged with total damage put at over $1 million. There was some flooding of houses and businesses. Strong winds did extensive roof damage to a school and power lines. Lightning caused numerous minor fires. Agriculture was also affected, especially cotton, with much acreage under one to two feet of water.

Bullhead City in Mohave County was devastated between the evening of the 16th and the morning of the 17th. A number of washes became raging torrents. There was severe damage to streets, highways, residences, and businesses. Damage to homes and places of business was put at $250,000. Some streets were gouged out to a depth of three to five feet and resembled small canyons. The hardest hit highway was the junction of 95 and 68 where raging waters tore up one-thousand-pound chunks of pavement and tossed them to the side in powerful surges. Several dikes were heavily damaged.

In southeastern California, Doreen dumped 4.5 inches of rain within several hours, flooded three hundred homes, started fires, eroded and undermined streets and highways, temporarily contaminated drinking water, caused utility outages and broke the Imperial Irrigation District's 3,100-mile network of canals and ditches in numerous places, and caused $9 million in crop damages and $4 million in property damage.

October 1977

One of the most notable weather events of 1977 occurred during the first part of October. Several days of heavy rains caused severe flooding on the Santa Cruz and San Pedro rivers (and other tributaries) in the southern portions of the state, forcing 700 people from their homes and producing severe damage to crops, goods, livestock, water supplies, and property. Miraculously, no lives were lost. The heavy rains were due to tropical storm Heather which moved toward the Baja peninsula and became a hurricane on October 5. On October 6 at noon, its classification was downgraded to a tropical depression. Perhaps the most notable aspect of the storm was the persistently localized and intense rainfall in extreme southern portions of the state (and also across the border). Although almost all of Arizona received some precipitation during the first ten days of the month, the heaviest and most prolonged rainfall occurred in the San Pedro and Santa Cruz river basins. Nogales officially reported 8.3 inches, but unofficial reports indicate that amounts up to 12.0 inches were received in various parts of that community.

INDEX OF PLACE NAMES